


User guidance and operating instructions
software version 5.x
Design Features

- Microprocessor-controlled 2-wire pressure transmitter
- Text-oriented operating control via graphic display
- Parameterization on the transmitter or optional with a HART protocol
- Turndown 20:1
- Measuring ranges 16 mbar up to 400 bar
- Output signal: 4...20 mA, 2-wire. HART protocol (option)
- Housing and wetted parts of stainless steel, type of protection IP 65 or IP 67
- Explosion protection (gas)
- EMC test as per NAMUR 21 and valid EC guideline

Contents

Technical data	page 1
Connection examples	page 2
General information	page 3
Menu overview	page 4
Working menus	page 4-6
Operating menus	page 6-12
Mounting and operating instructions	page 12
Operating-menu flowcharts	page 13-15
Menu structur for Handheld-Communicator 275	page 16-17

Introduction

These operating instructions refer to installation, commissioning, servicing and adjustment. Statutory regulations, valid standards, additional technical details in the relevant data sheet, details of the type plate and any additional certificates are to be observed along with these operating instructions.


Safety instructions

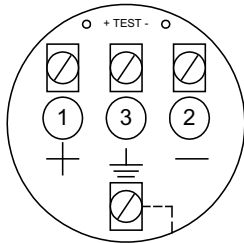
- Installation, operation and maintenance of the instrument may be executed by authorized personnel, only, using suitable equipment.
- Prior to the disassembly of the pressure transmitter the impulse ducts between the measuring transmitter and the process have to be locked and relieved from pressure.
- The standard nominal pressure rating and the permissible operating temperature of the gasket should be observed for all process connections. Operation outside the allowed nominal pressure rating, especially with clamp connections, is only possible with suitable clamps. In this case, note DIN 32676 for stipulations on heat resistance.
- Pressure transmitters that are mechanically defective can cause injuries or give rise to process faults. Suitable precautions should be taken to avoid this.

Technical Data

Output signal	: 4...20 mA
Supply	: 24 V DC
Function range	: 12...50 V DC, standard 12...30 VDC, Ex protection
Test output	: Uninterruptible current measurement at test contacts
Pressure ranges	: 160 mbar 400 bar, staggered
Noise immunity	: EMC as per industrial standard
Ex-certification	: TÜV 99 ATEX 1414 X
Menus	: 4 x working menus 12 x operating menus
Type of protection	: IP 65 measuring ranges 1...40 bar rel. (option: IP 67 cable ventilation required) IP 67 measuring ranges 100...400 bar rel., and all absolute pressure measuring ranges
Namur-recommendation	: at state of November 2000

Putting into service

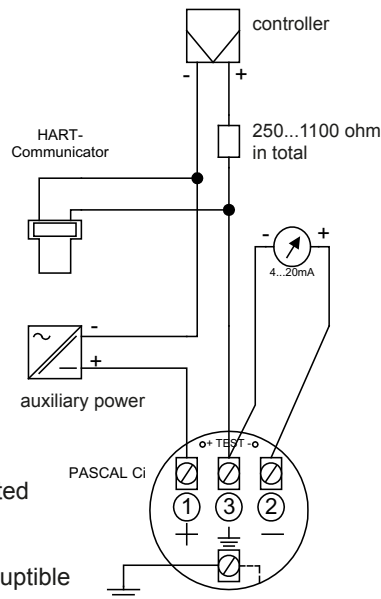
Connection terminals



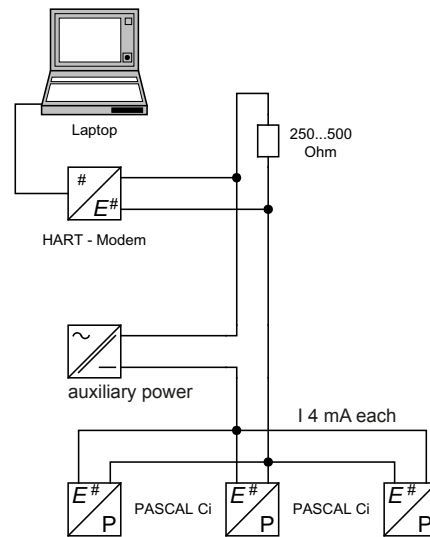
- 1 = + supply
- 2 = - supply
- 3 = Vacant terminal
- ⏏ = earth terminal connected to housing
- Test = Connection for testing equipment for uninterruptible current measurement

Connection examples

Point-to-point operation with inline analog indication and HART-Communicator



Multidrop (bus) operation with PC or laptop and HART modem



When the transmitter is switched on, an internal test program is run. The measured value is then displayed in the pre-selected working menu. Should the test program locate an error, a message is displayed, which is used by LABOM Field Service for fault analysis.

General

The CI type-series pressure transmitters may be exchanged with transmitters with standard 2-wire connection circuitry, and with the 4-20 mA output signal. The engineering unit "pressure" is converted into a proportional electrical signal by means of piezoresistive sensor elements. The signals are then digitally processed by a microcontroller. The capabilities of the pressure transmitters are thus superior to comparable analog systems.

Operator inhibit

The control system has an operator-inhibit feature under software control. It serves to inhibit parameter modifications. The inhibit may be enabled/disabled by simultaneously holding the left and right key pressed for at least 15 s.




The operator inhibit is not available on the CI 2000 version with LC display.

LC display

The measured value is displayed on this display. The display also serves as a text-oriented user guidance facility. This matrix display allows the measured value to be displayed in excellent quality (with enlarged digits), and offers comprehensive textual explanation of programming and operator entry commands.




3-key operator control with CI 1000 version with LC display

3 keys, situated underneath the display, are used to operate the pressure transmitter operating functions, such as, trimming, spreading, damping, etc. Access is gained to the 3 keys by removing the bezel. The keys are lettered according to their function, as follows:

- KEY  :Page up in menu/increment
- KEY  :Cursor positioning
- KEY  :Entry/selection confirmation, ENTER function

3-key operator control with CI 2000 version without LC display

The operation of the pressure transmitter without LC display is restricted to setting lower and upper range limits. Three buttons are visible when the closed front cover is removed.

- KEY**  Load the actual applied pressure as lower range limit.
The current settles at 4 mA.
- KEY**  Not used
- KEY**  Load the actual applied pressure as upper range limit.
The current settles at 20 mA.

Note: The "Set lower range limit" and "Set upper range limit" commands are not executed, when the actual pressure lies outside the limits of measuring range.

The adjusted span is only altered by "Set zero-point", if the lower range limit + span is greater than the allowed upper range limit. If this is the case, the upper range limit is set to the maximum allowed upper range limit. If a minimum-span undershoot occurs, the "Set lower range limit" command will not be executed.

Menu overview

Working menus

Display:
Pressure value and
analog bar graph

Display:
Pressure value and
sensor temperature [°C]

Display:
Pressure value and
% display

Display:
Pressure value and
output current [mA]

Operating menus

1 meas.-range
change

2 electr. damping
change

3 min/max values
display

4 output function
change

5 physical unit
change

6 measuring-circuit
test

7 alarm status
change

8 current trimming
change

9 trimming
change

10 table function
change

11 factory data
display

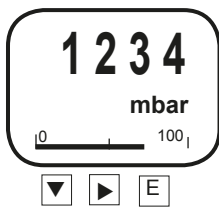
12 language
change

4 variants for displaying
the measured value, may be
selected for continuous display.

12 operating modes for displaying and changing
parameters and operating states.
Individual menus can be disabled, please specify when
placing your order.

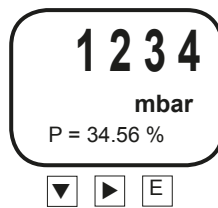
Working menus

The measured value is continuously displayed in the working menu, as long as no adjustments are being performed on the transmitter. A choice of 4 working menus is available.



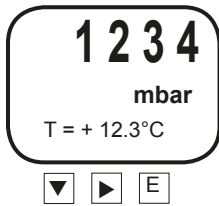
Display pressure value and analog bar graph (% f.s.)

Key E selects next working menu
Key ▼ selects 1st operating menu



Display pressure value and % value, with reference to full scale value

Key E selects next working menu
Key ▼ selects 1st operating menu



Display pressure value and sensor temperature °C

Key E selects next working menu
Key ▼ selects 1st operating menu



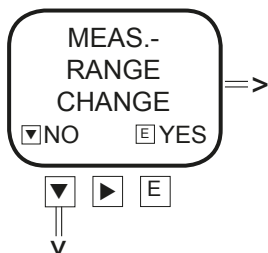
Display pressure value and output current

Key E selects 1st working menu
Key ▼ selects 1st operating menu

Should an operating menu be selected (per keystroke), the previous working menu is re-selected after approximately 5 min, if no key is pressed. The operating menu is re-selected by simultaneously pressing the left and middle keys. This function may be called up from any program item. An entry may be aborted with this function.

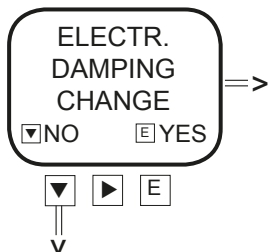
Operating menus 1-3

Operating states may be queried, and parameters changed in operating menus. The functions of the keys are specified on the display. The following menus are available:



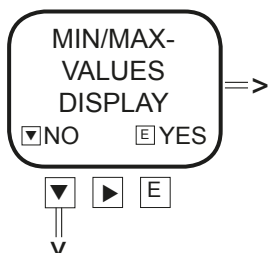
Operating menu 1

The operating range is defined here by entering the desired pressure values for 4 mA and 20 mA current-output values. The limits are to be found in the data sheet. If the lower range value is changed, the pre-selected span remains unchanged, as long as the measuring range limits are not exceeded.



Operating menu 2

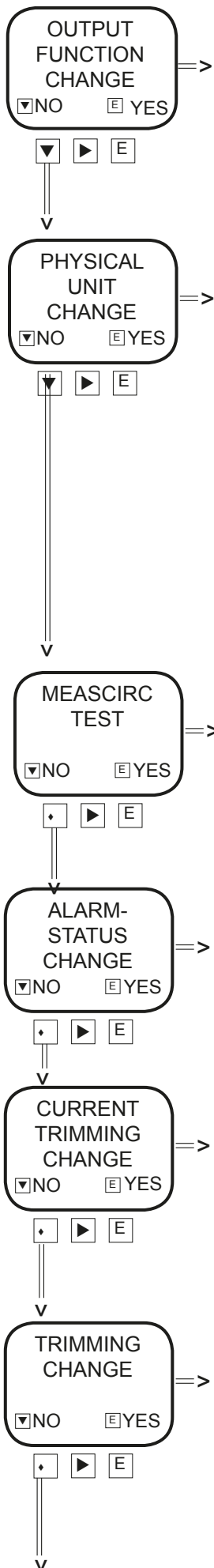
The adjusted output-signal damping is displayed. The values may be changed.
Range: 0...30 s, in 0,2 s-steps.



Operating menu 3

Display min/max values for pressure and temperature. These values may also be deleted.

Operating menus 4-9



Operating menu 4

The transmission function is displayed. It can be toggled:

LINEAR : 4...20 mA output function

SQRT : 0...6 % linear, from 6 % characteristic curve is root extracting

TAB : Transfer function according to user table
max. 12 programmable points
see operating menu 10

INVERS : 20...4 mA output function

Operating menu 5

The physical unit displayed in the working menu may be changed; the measured value is automatically converted to the chosen unit.

The following units are available:

mbar/bar; mWC; kPa; mmHg; psi; %; mA

Nominal ranges and engineering units

nominal ranges		adjustable engineering units							
		mbar	bar	mmHg	mWS	KPa	psi	%	mA
160	mbar rel.	x		o	o		o	o	o
1000	mbar rel.	x		o	o	o	o	o	o
4000	mbar rel.	x		o	o	o	o	o	o
16	bar rel.		x		o	o	o	o	o
40	bar rel.		x		o	o	o	o	o
100	bar rel.		x				o	o	o
400	bar rel.		x				o	o	o
1000	mbar abs.	x	o	o	o	o	o	o	o
4000	mbar abs.	x		o	o	o	o	o	o
16	bar abs.		x		o	o	o	o	o

x standard (preselected)

o unit adjustable

Operating menu 6

Output currents between 3.6 mA and 21.5 mA may be selected in 0.01 mA steps to test peripherals.

Operating menu 7

The alarm status is displayed in case of malfunction. The output returns to < 3.6 mA irrespective of the pressure state. It can be switched to > 21.0 mA in case of malfunction.

Operating menu 8

Indication errors in downstream devices may be trimmed by adapting the 4...20 mA signal.

Operating menu 9

This function should only be performed, when the available pressure reference values are precise and stable. Two types of trimming are available:

1. Trimming the lower range value

Apply and confirm pressure corresponding to the lower range value chosen in operating menu 1. The lower range value is corrected, only. The sensitivity remains unchanged (e.g. zero-point correction or installation position).

2. Trimming the span

The procedure described in 1 should be followed. Then apply and confirm pressure corresponding to the full-scale value chosen in operating menu 1.

The diagram illustrates the menu structure for the 'Working menu'. It consists of three main menu items, each represented by a rounded rectangle with a title, a right-pointing arrow, and two selection options: 'NO' (with a left arrow icon) and 'YES' (with an 'E' icon). Below each item are three icons: a left arrow, a right arrow, and an 'E' icon. A double arrow points from the left arrow icon to the next menu item.

- TABLE FUNCTION CHANGE** (Right arrow)
 - ☒ NO ☐ YES
 - Left arrow icon, Right arrow icon, E icon
- FACTORY-DATA DISPLAY** (Right arrow)
 - ☒ NO ☐ YES
 - Left arrow icon, Right arrow icon, E icon
- SPRACHE LANGUAGE CHANGE** (Right arrow)
 - ☒ NO ☐ YES
 - Left arrow icon, Right arrow icon, E icon

Working menu

The transfer function between applied pressure value and electrical output signal can be defined by entering max. 12 points. Window functions are also available. The digital display is not affected, it always shows the applied pressure value.

Querying the software version and selecting the basic setting. The transmitter can be reset to a factory setting. Factory trimming, nominal range and standard parameters are also reactivated by reset.

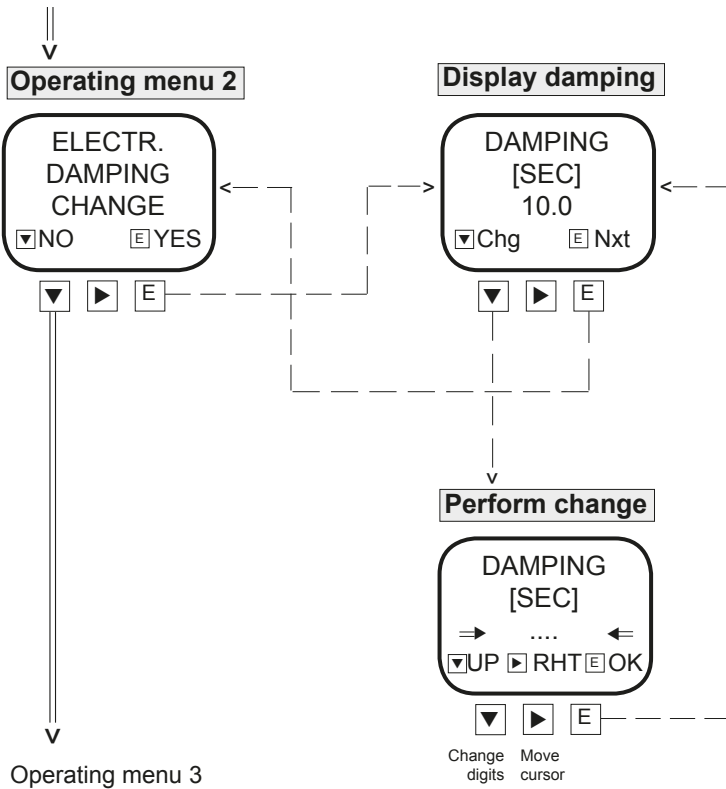
The display language is shown. GER/ENGL is available.

```

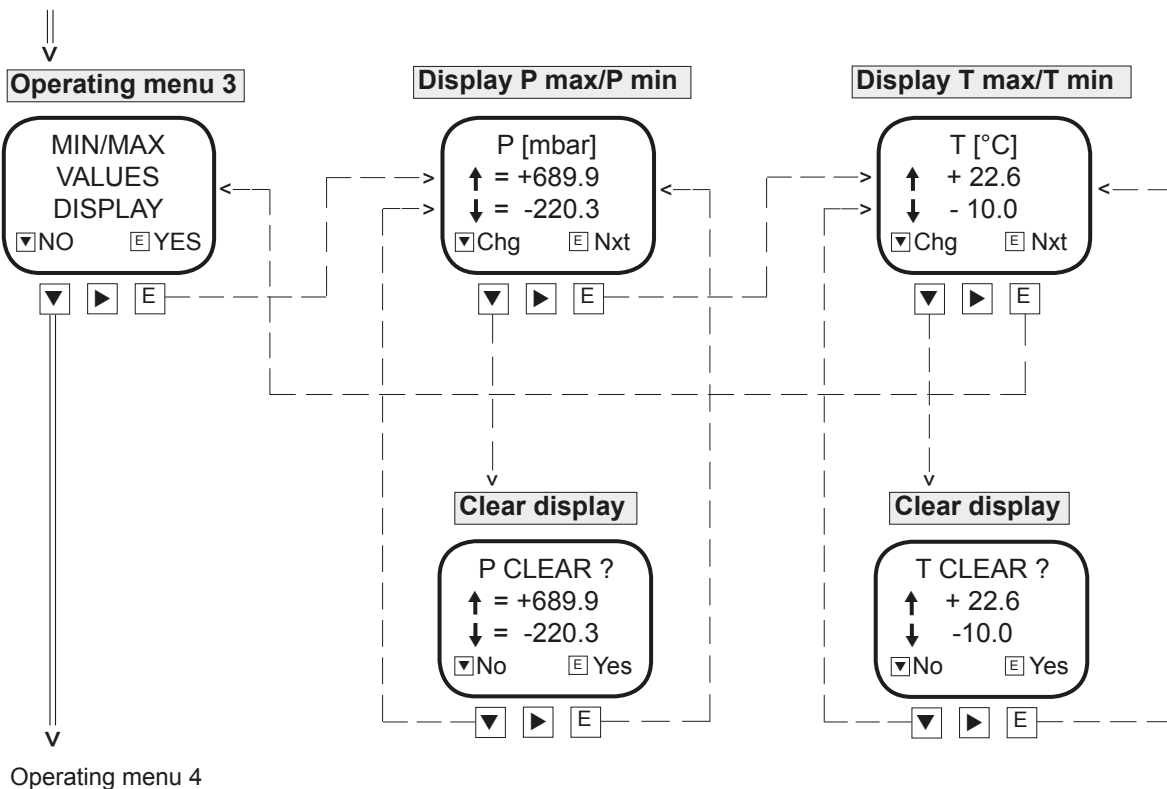
graph TD
    OM1[Operating menu 1  
MEAS.-RANGE CHANGE  
▼NO ◀YES]
    DLRV[Display lower range value  
P (4 mA) [bar]  
+1.000  
▼Chg ◀Nxt]
    DFRV[Display full scale value  
P (20 mA) [bar]  
+8.500  
▼Chg ◀Nxt]
    PC1[Perform change  
P (4 mA) [bar]  
⇒ ... ◀  
▼UP ▶RHT◻OK]
    PC2[Perform change  
P (20 mA) [bar]  
⇒ ... ◀  
▼UP ▶RHT◻OK]
    OM2[Operating menu 2]

    OM1 -- YES --> DLRV
    OM1 -- NO --> OM2
    DLRV -- Chg --> DFRV
    DLRV -- Nxt --> PC1
    DFRV -- Chg --> DFRV
    DFRV -- Nxt --> PC2
    PC1 --> OM2
    PC2 --> OM2
  
```

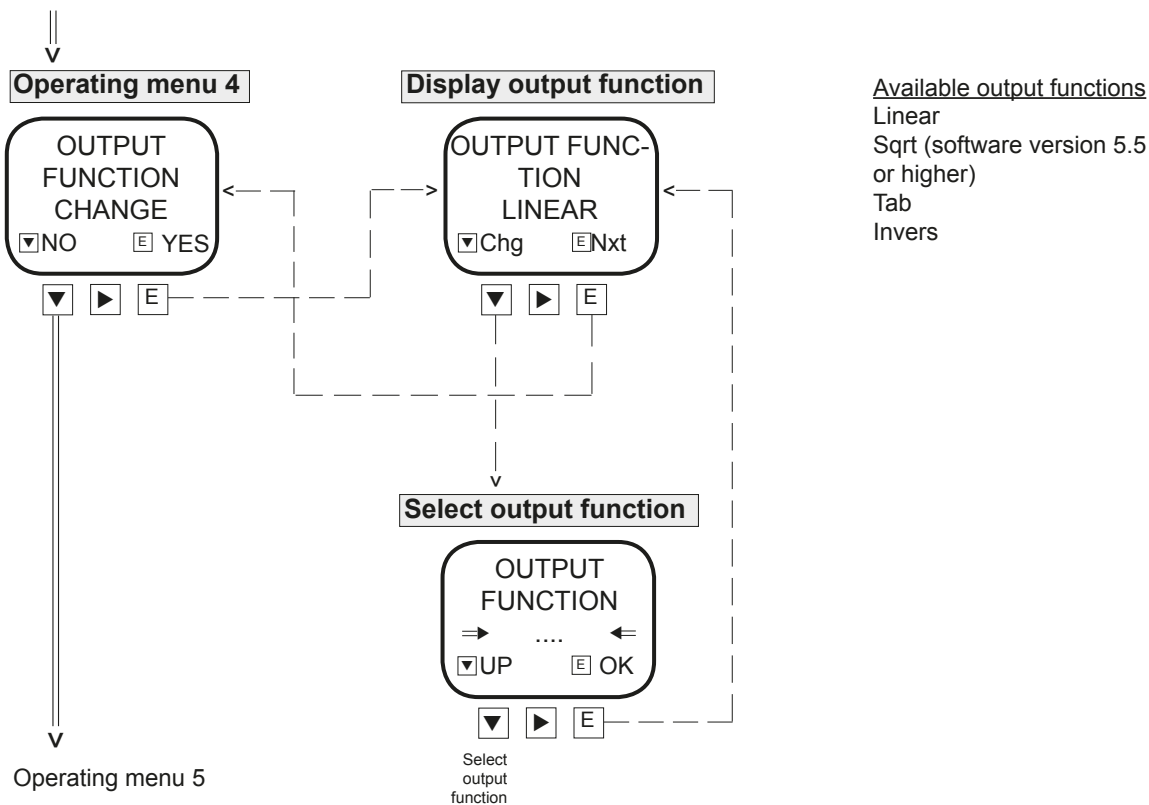
Change electrical damping



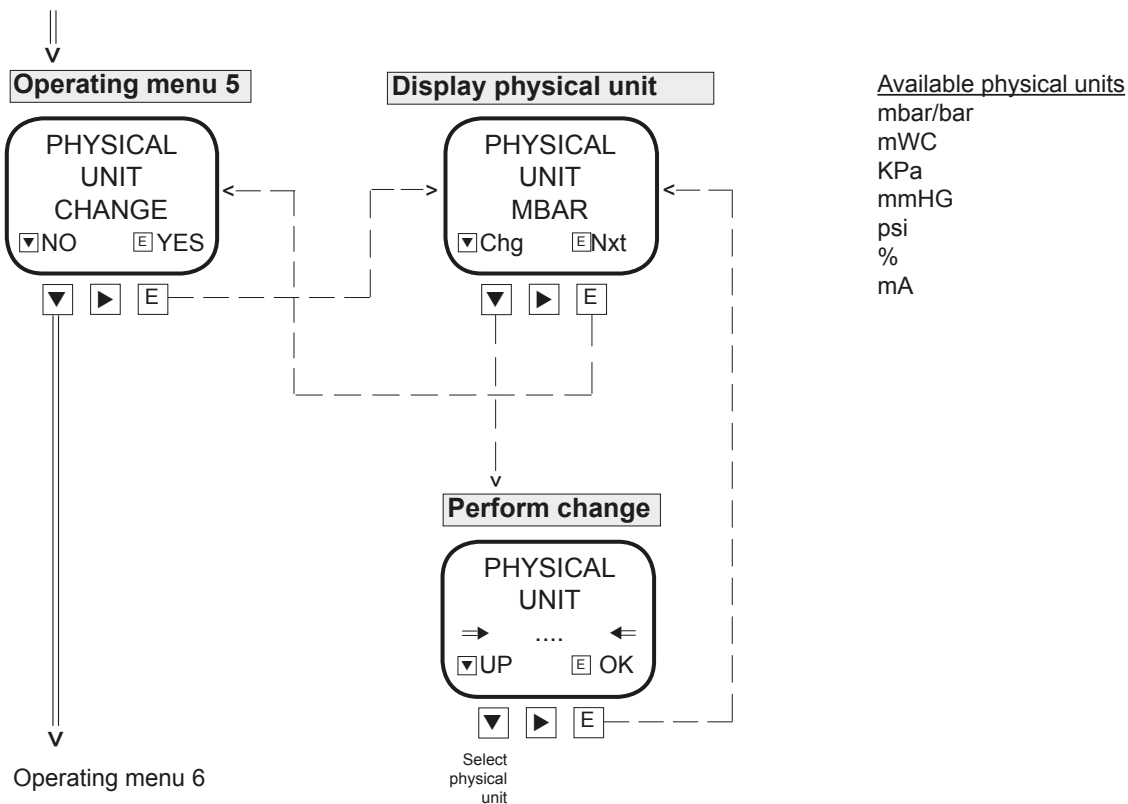
Display min/max values



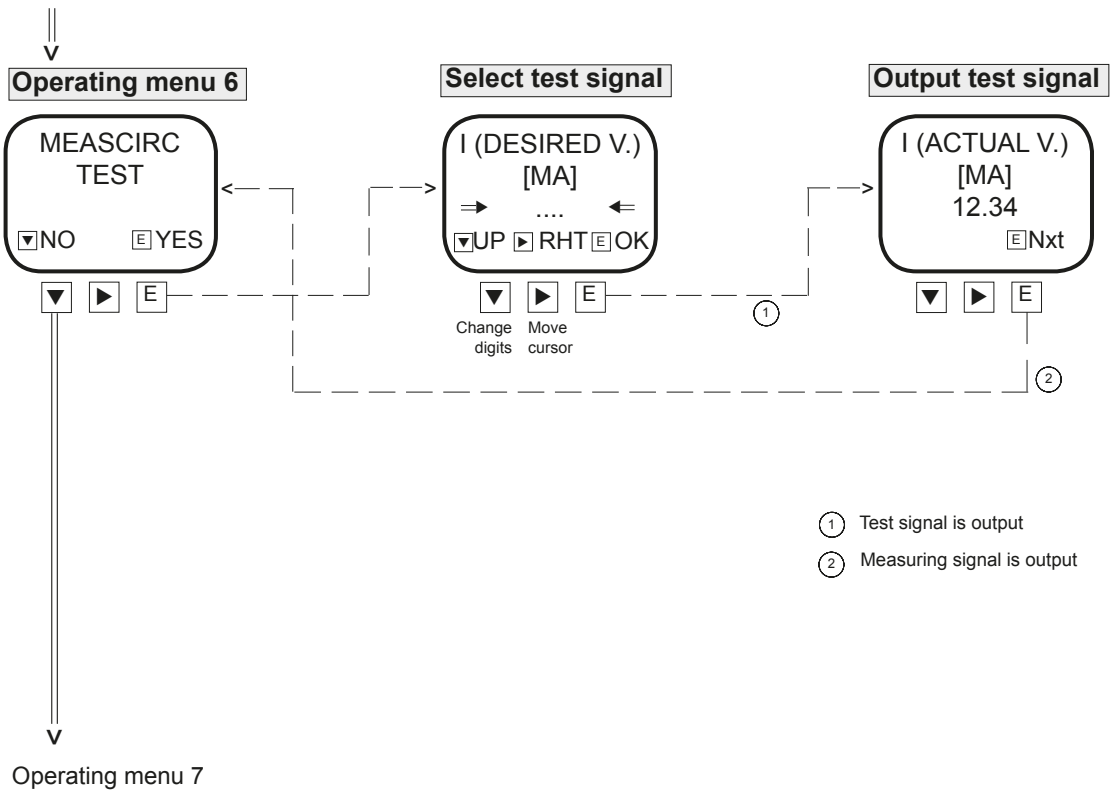
Change output function



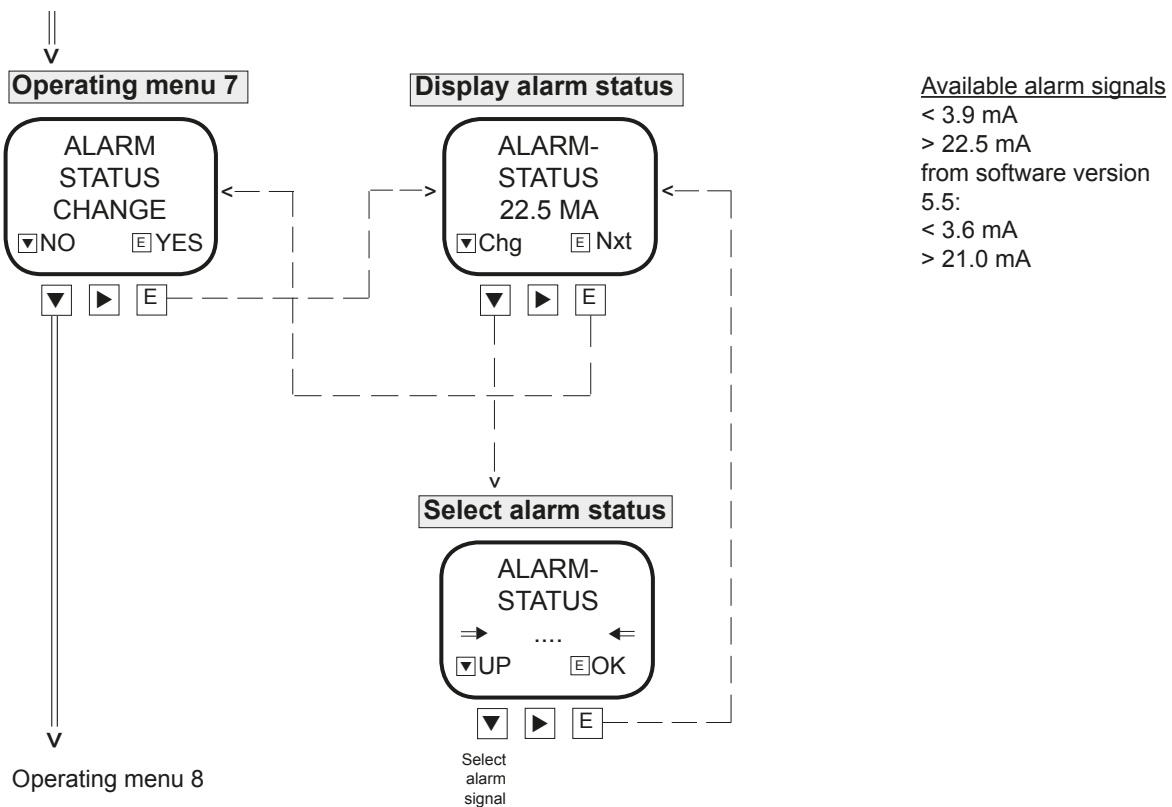
Change physical unit



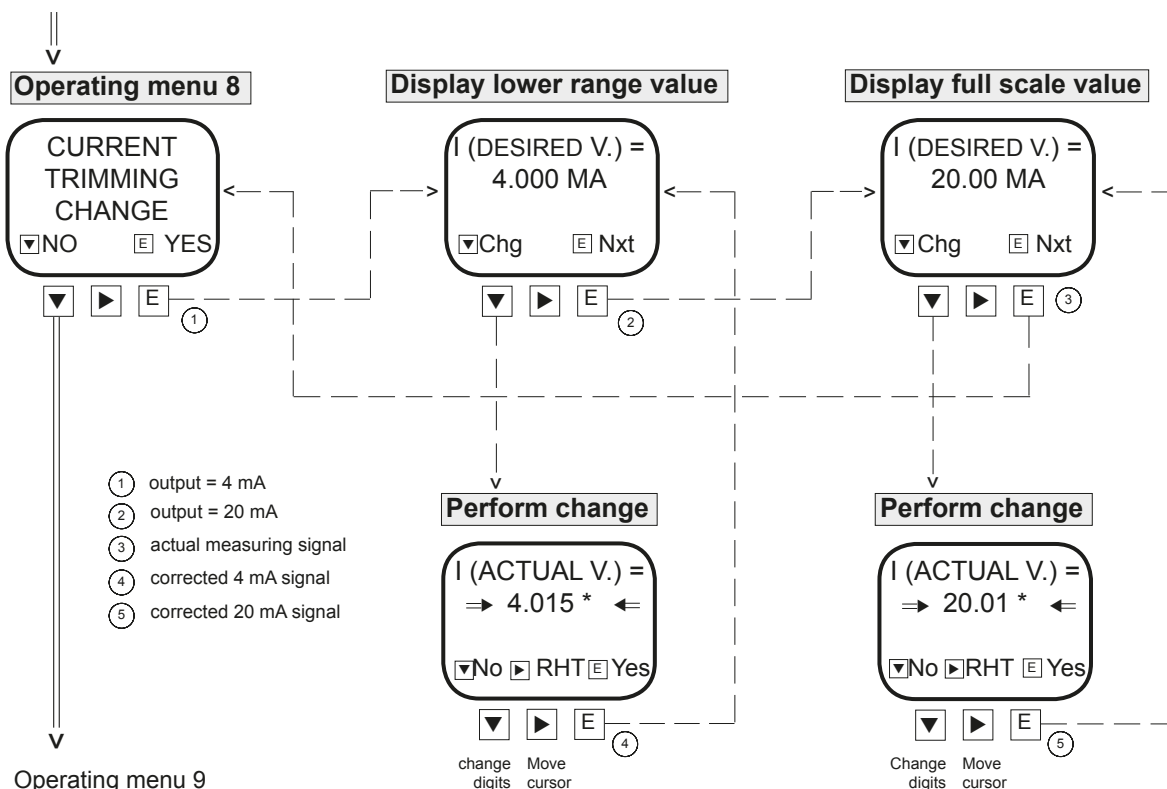
Measuring-circuit test



Change alarm status

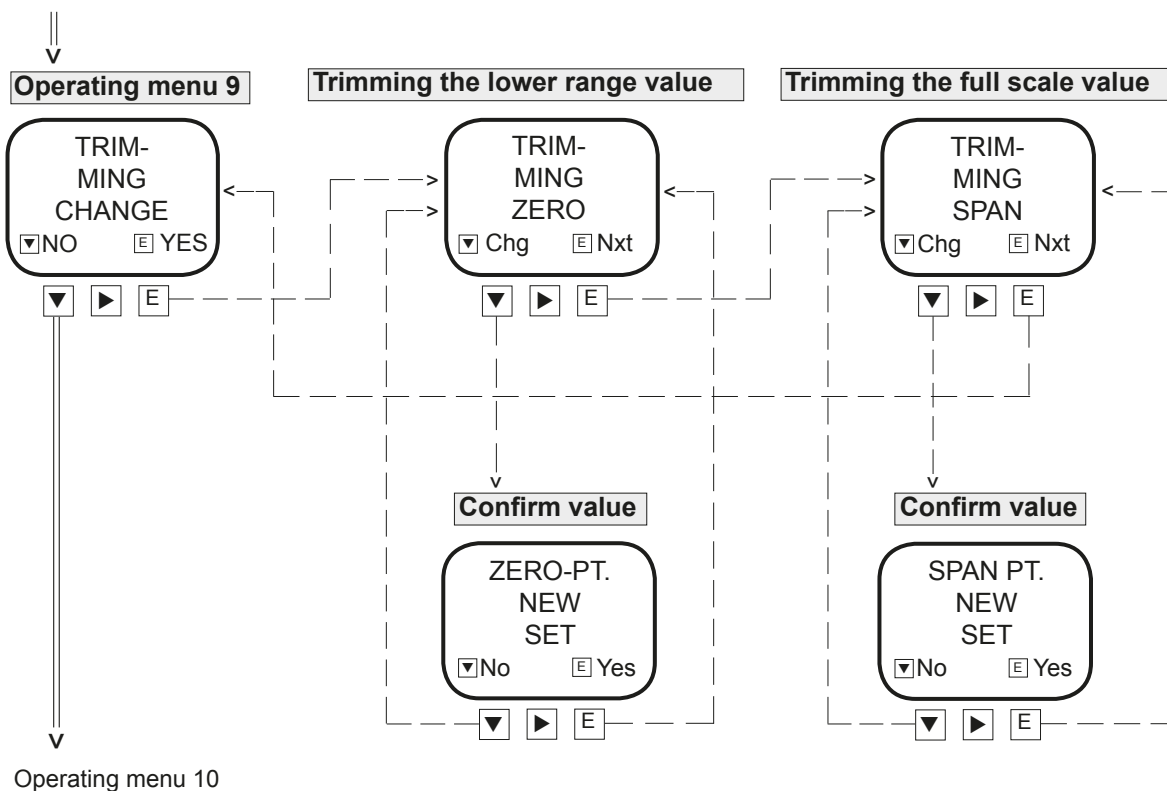


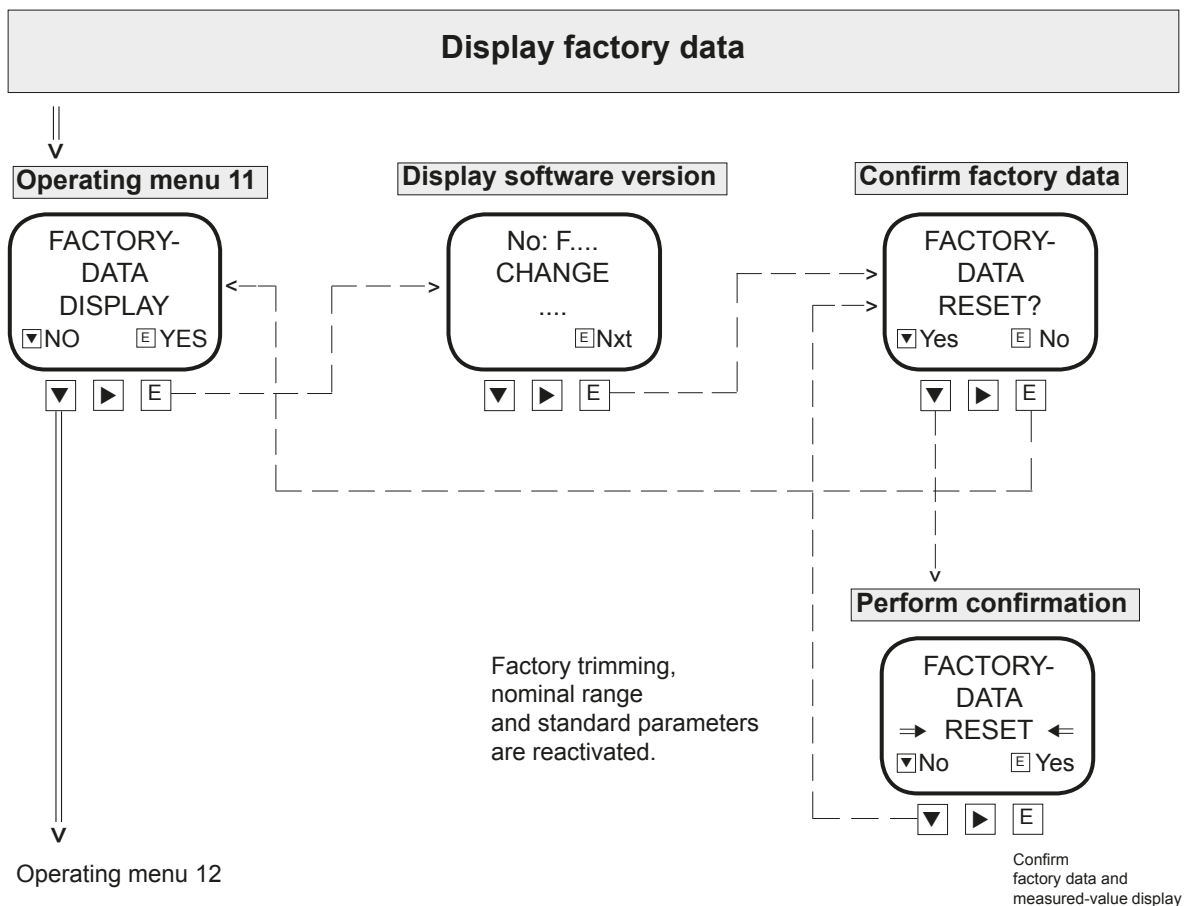
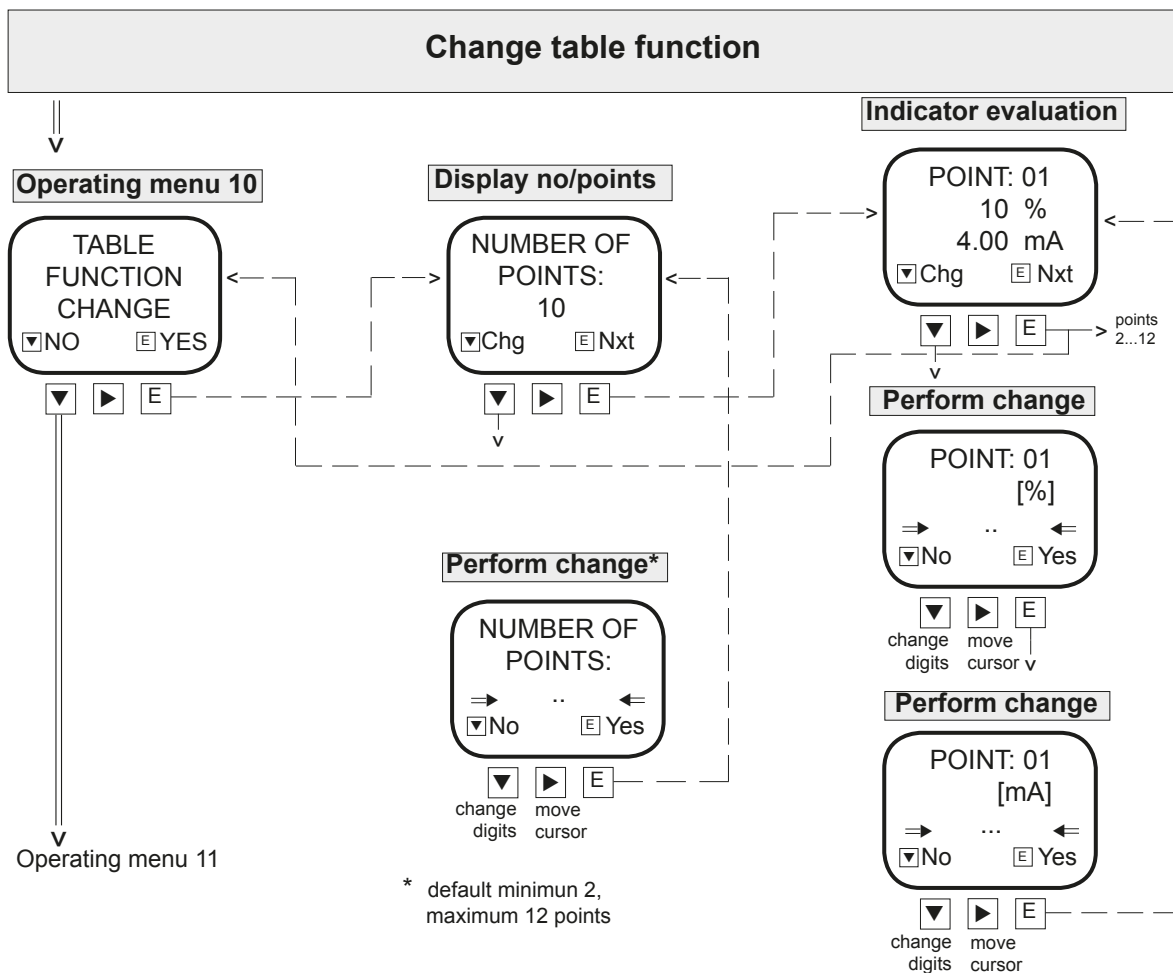
Change current adjustment

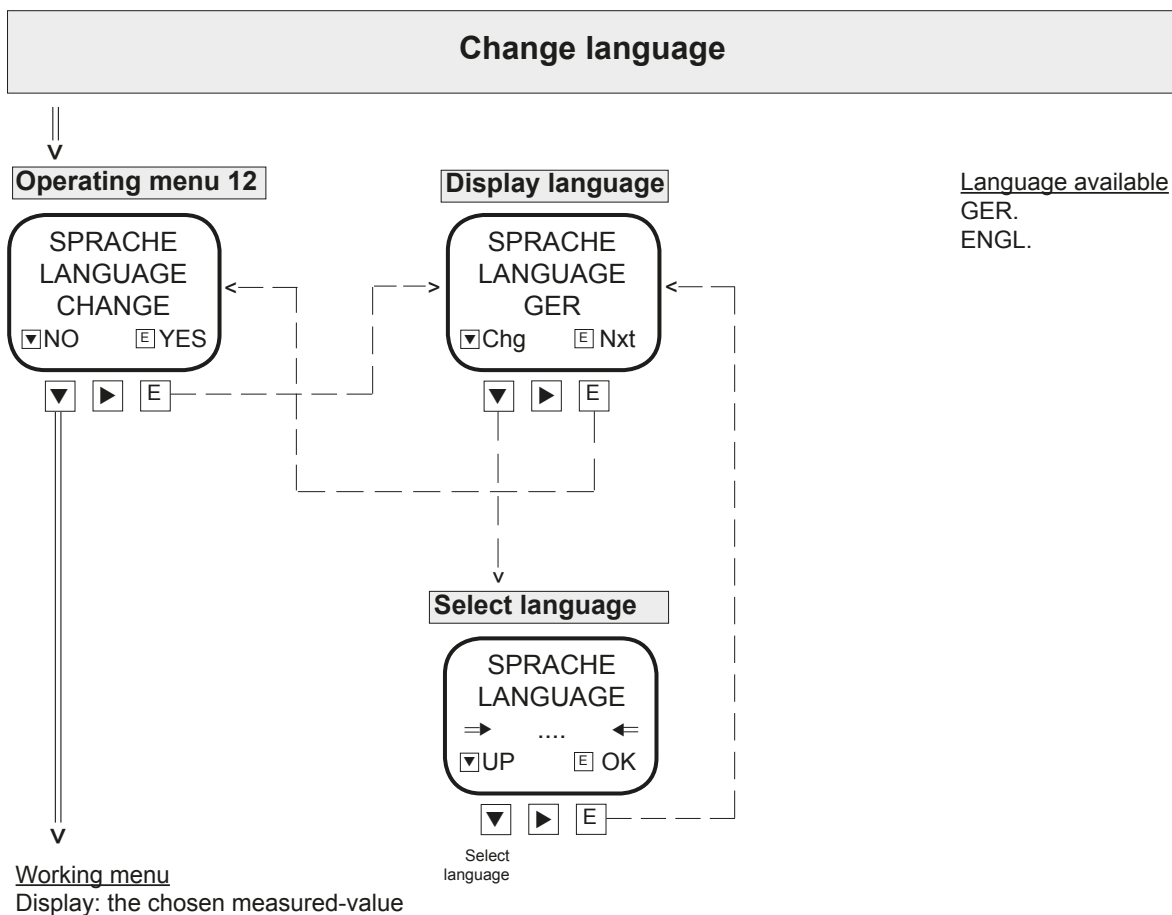


* The numerals should be specified in full !

Change trimming







Mounting and operating instructions

The transmitters are adjusted and calibrated at the factory. They should only be installed and commissioned by competent personnel; user guidance and data sheets should be observed. The transmitters do not normally require any subsequent adjusting. You may need to correct the zero point, if you alter the installation position. Please note that the measuring span is not effected by the zero-point correction.

Depending on the version, an aerated connecting cable (IP 67), or an integrated filter (IP 65) is used to compensate the internal pressure in excess-pressure ranges up to 40 bar. Higher measuring ranges or absolute pressure ranges do not require any pressure compensation to atmosphere. The named protection types are only achieved, when the transmitter has been correctly installed, both ring nuts screwed tight, and the cable diameters correspond with the nominal sizes of the sealing inserts in the case (conduit thread screwings).

The integral EMC measures are only effective with a correct earth connection.

State-of-the-art technology is used, and is continuously updated.

Factory adjustment:

Measuring range calibrated:	0...nominal range for 4...20 mA
Damping programmed:	0 s
Signal output upon error:	< 3.6 mA
Physiscal unit:	bar or mbar
Signal evaluation:	linear
User-guidance language:	German

We can also supply other basic settings - please specify with your order.

Electrical equipment in hazardous areas should only be installed and commissioned by competent personnel.

Modifications to devices and connections destroy the ex-proofing and the guarantee. The complete cable run, both inside and outside the hazardous areas in intrinsically safe circuits, should be equipotentially bonded. The limit values set out in the EC type Examination Certificate are to be observed.

The CE designation for the transmitter certifies compliance with European Council guidelines (89/36/EEG), EMC legislation (13/11/1992), current generic standards, and product and basic standards. Clear operation in systems and plants is achieved when the conditons for screening, earthing, wiring and potential isolation are fulfilled.

1. Introduction

This section describes the errors that can occur in the Pascal device during the self-test (startup) and during operation. Some of these errors can be corrected by the device. The other errors can only be corrected by LABOM customer service.

2. System test: No error detected

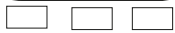
```
PASCAL
REV: 5.x
SYSTEST:
* OK *
```



No errors were found during the system test. The device goes into the standard operating mode.

3. System test: Error external sensor number

```
PASCAL
REV: 5.x
SYSTEST:
ERR: EEP
```



After approximately 3 seconds, the following information is displayed:

```
FAILURE
SENSOR NO
RESET!
NXT
```



Cause: The sensor number of the sensor module could not be correctly read. This means that the internal compensating data cannot be checked for validity.

Remedy: Press key 3 to reset the device. The system again attempts to restart.

4. System test: Error incorrect sensor number

```
PASCAL
REV: 5.x
SYSTEST:
ERR: SNR
```



After approximately 3 seconds, the following information is displayed:

```
SENSOR-
DATA
COPY
YES NO
```



Cause: The sensor number of the sensor module does not match the internal sensor number. This message occurs after the sensor module has been replaced because the existing internal parameters no longer apply to the new sensor.

Remedy: Press key 3 to reset the device. The system again attempts to restart.
Press key 1 to start the copy procedure. The following information is displayed:

```
SENSOR-
DATA
COPY
! == > !
```



If the copy procedure is completed without error, the device resets and the system restarts. However, if an error is identified, the copy procedure is repeated up to 3 times. After the third attempt, the device resets and the system again attempts to restart.

5. System test: Error in an EEPROM data block

```
PASCAL
REV: 5.x
SYSTEST:
ERR: EEP
```

After approximately 3 seconds, the following information is displayed:

```
FAILURE
CHECKSUM
EEP: 001
NXT
```

Cause: The checksum of an internal data block is invalid. With this condition, proper operation of the device cannot be ensured. The number displayed shows the data block in which the error was found. The following numbers are possible:

- 01 General parameters
- 02 Measurement range data
- 08 Function table
- 16 Temperature data
- 32 Compensating data

Remedy: Some of these errors are cleared automatically when the sensor data are copied over by the internal program data. During a copy procedure, all previous entries are replaced with the factory settings. Press key 3 to start the copy procedure. The following information is displayed:

```
SENSOR
DATA
COPY
YES NO
```

1 3

After key 3 is pressed, the device resets and the system attempts to restart.
Press key 1 to start the copy procedure. The following information is displayed:

```
SENSOR-
DATA
COPY
! ==> !
```

If the copy procedure is completed without error, the device resets and the system restarts. However, if an error is identified, the copy procedure is repeated up to 3 times. After the third attempt, the device resets and the system again attempts to restart.

6. System test: Watchdog error - entry

```
PASCAL
REV: 5.x
SYSTEST:
ERR: WDG
```

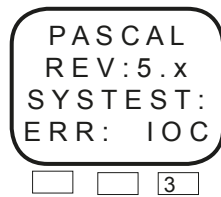
After approximately 3 seconds, the following information is displayed:

```
FAILURE
WATCHDOG
RESET!
NXT
```

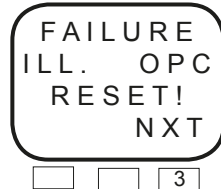
Cause: An error was discovered in the program sequence. This error could be caused by conditions such as electromagnetic interference ("noise") or a defective component.

Remedy: Press key 3 to reset the device. The system again attempts to restart

7. System test: error illegal opcode



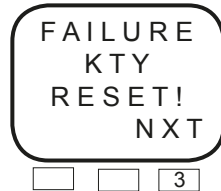
After approximately 3 seconds, the following information is displayed:



Cause: An error was discovered in the program sequence. This error could be caused by conditions such as electromagnetic interference ("noise") or a defective component.

Remedy: Press key 3 to reset the device. The system again attempts to restart.

8. System test: error in temperature detection

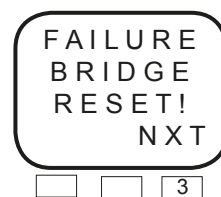


Cause: This message can be triggered by two possible causes.

1. A temperature lying outside the applicable limit values was detected.
2. The temperature measuring circuit was damaged (sensor or signal conditioning faulty).

Remedy: Press key 3 to reset the device. The system again attempts to restart. Please note the transmitter must first be cooled down to a valid operating temperature before it will start functioning properly again.

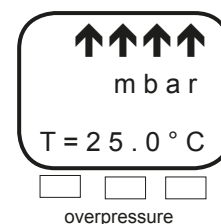
9. System test: error in pressure detection



Cause: This message may appear if the measuring bridge is damaged.

Remedy: Press key 3 to reset the device. The system again attempts to restart.

10. Operation: Overflow or underflow of the measurable pressure range

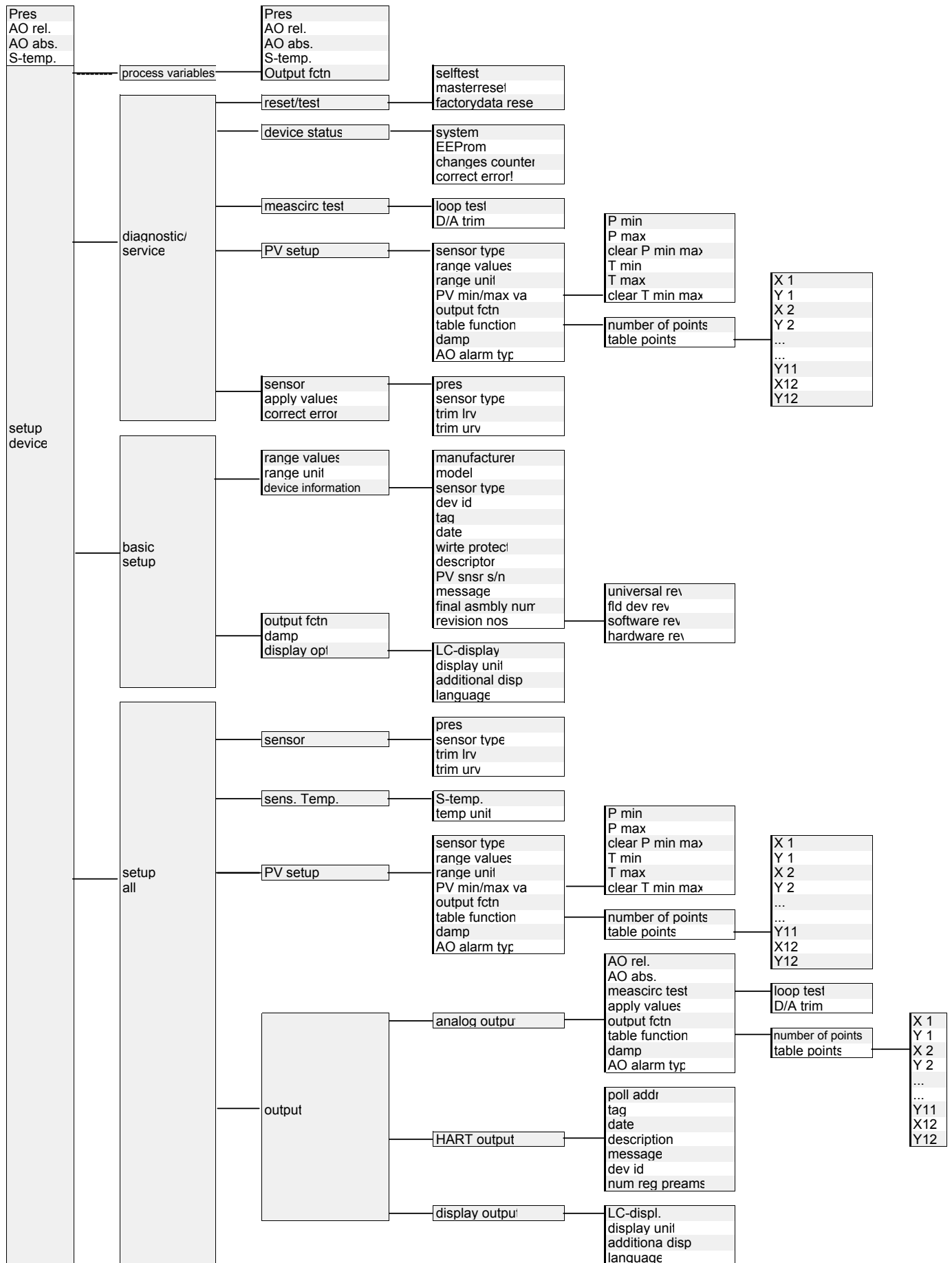


overpressure

Cause: This message appears (flashing) if the measuring cell is subjected to pressure or vacuum outside the measurable range. This does not refer to the nominal range. At the same time this error message appears, the programmed amount of fault current is output. As soon as the pressure measured is valid once again (lies within the measurement range), this fault current is automatically acknowledged and the transmitter functions normally.

Remedy: Keep the pressure within the measuring range limits.

Menu structur of Handheld-Communicator 275



Menu structur of Handheld-Communicator 275

